

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): A An isolated sorbitol dehydrogenase having the following physicochemical properties:

- (a) action: catalyzes the reaction converting D-sorbitol to s L-sorbose;
- (b) molecular weight: about 54 kDa;
- (c) coenzyme: NAD (P)<sup>+</sup> dependent; and
- (d) substrate specificity: specifically oxidizes sorbitol, mannitol and arabitol, but does not act on xylitol, ribitol, inositol or glycerol.

Claim 2 (Original): The sorbitol dehydrogenase of claim 1, which is derived from the strain *Gluconobacter oxydans* G624.

Claim 3 (Cancelled):

Claim 4 (Cancelled):

Claim 5 (Currently Amended): A An isolated sorbitol dehydrogenase which is the following protein (a) or (b):

- (a) a protein consisting of an amino acid sequence depicted in ~~Sequence Listing~~ SEQ ID NO: 1; or
- (b) a protein consisting of the same amino acid sequence as (a) above, except that one to several amino acids is (are) deleted, substituted, inserted, added or modified, and catalyzing the reaction converting D-sorbitol to L-sorbose.

Claim 6 (Withdrawn, Previously Presented): A DNA encoding the sorbitol dehydrogenase as claimed in claim 1.

Claim 7 (Withdrawn, Currently Amended): The DNA of claim 6, which is (a) or (b) in the following:

(a) a DNA having a base sequence of base numbers 537 - 1991 of the base sequence depicted in Sequence Listing SEQ ID NO: 2; or

(b) a DNA capable of hybridizing to the base sequence of the above-mentioned (a) under stringent conditions.

Claim 8 (Withdrawn, Previously Presented): The DNA of claim 6, which is derived from bacteria belonging to the genus *Gluconobacter*.

Claim 9 (Withdrawn, Original): A gene encoding a protein having a sorbitol dehydrogenase activity, which is a DNA capable of hybridizing a DNA having a base sequence of base numbers 537 - 1991 of the base sequence depicted in Sequence Listing SEQ ID NO: 2 and a partial DNA thereof.

Claim 10 (Currently Amended): A An isolated protein derived from the genus *Gluconobacter*, which is encoded by ~~the gene of claim 9~~ a gene

which is a DNA capable of hybridizing under stringent conditions with a DNA having a base sequence depicted in SEQ ID NO: 2 or a partial DNA thereof, and

which has a sorbitol dehydrogenase activity.

Claim 11 (Withdrawn, Currently Amended): A promoter gene comprising the DNA of the following (a) or (b)

(a) a DNA having abase sequence of base numbers 1 - 536 of the base sequence depicted in Sequence Listing SEQ ID NO: 2; or

(b) a DNA having a base sequence of the above-mentioned (a) wherein one to several bases is(are) deleted, substituted, inserted, added or modified, which DNA shows a promoter activity at least in one kind of microorganism.

Claim 12 (Withdrawn, Previously Presented): A recombinant vector comprising a DNA as claimed in claim 6.

Claim 13 (Withdrawn, Previously Presented): An expression vector comprising a DNA as claimed in claim 6.

Claim 14 (Withdrawn, Original): The expression vector of claim 13 further comprising a DNA encoding sorbose dehydrogenase and/or a DNA encoding sorbosone dehydrogenase.

Claim 15 (Previously Presented, Withdrawn): A transformant obtained by transforming a host cell with an expression vector of claim 13.

Claim 16 (Withdrawn, Original): The transformant of claim 15, which belongs to a genus selected from the group consisting of *Escherichia coli*, the genus *Pseudomonas*, the genus *Gluconobacter*, the genus *Acetobacter* and the genus *Pseudogluconobacter*.

Claim 17 (Withdrawn, Previously Presented): The transformant of claim 15, which is capable of converting D-sorbitol to 2-keto-L-gluconic acid.

Claim 18 (Withdrawn, Currently Amended): A method for producing a protein having a sorbitol dehydrogenase activity, ~~which method comprises~~ comprising:

culturing a host cell transformed with an expression vector of claim 13 in a medium and harvesting the sorbitol dehydrogenase encoded by said expression vector of claim 1 ~~or the protein of claim 10 from the obtained culture.~~

Claim 19 (Withdrawn, Original): A method for producing an L-sorbose, which method comprises culturing a host cell transformed with an expression vector of claim 13 in a medium and bringing D-sorbitol into contact with the obtained culture or a treated product thereof.

Claim 20 (Withdrawn, Original): A method for producing 2-keto-L-gulonic acid, which method comprises culturing a host cell transformed with an expression vector containing a DNA encoding sorbose dehydrogenase and a DNA encoding sorbosone dehydrogenase in a medium and bringing the L-sorbose obtained according to the method of claim 19 into contact with the obtained culture or a treated product thereof.

Claim 21 (Withdrawn, Original): A method for producing 2-keto-L-gulonic acid, which method comprises culturing the transformant of claim 17 in a medium and bringing D-sorbitol into contact with the obtained culture or a treated product thereof.

Claim 22 (Withdrawn, Previously Presented): A method for producing L-ascorbic acid or an alkali metal salt thereof or an alkaline earth metal salt thereof, which method comprises converting 2-keto-L-gluconic acid obtained by the method of claim 20 to L-ascorbic acid or an alkali metal salt thereof or an alkaline earth metal salt thereof.

Claim 23 (Withdrawn, Previously Presented): A DNA encoding the sorbitol dehydrogenase as claimed in claim 5.

Claim 24 (Withdrawn, Currently Amended): The DNA of claim 23, which is (a) or (b) in the following:

(a) a DNA having a base sequence of base numbers 537 - 1991 of the base sequence depicted in Sequence Listing SEQ ID NO: 1; or

(b) a DNA capable of hybridizing to the base sequence of the above-mentioned (a) under stringent conditions.

Claim 25 (Withdrawn, Previously Presented): The DNA of claim 23, which is derived from bacteria belonging to the genus *Gluconobacter*.

Claim 26 (Withdrawn, Previously Presented): A recombinant vector comprising a DNA as claimed in claim 23.

Claim 27 (Withdrawn, Previously Presented) A recombinant vector comprising a DNA as claimed in claim 9.

Claim 28 (Withdrawn, Previously Presented): An expression vector comprising a DNA as claimed in claim 23.

Claim 29 (Withdrawn, Previously Presented): An expression vector comprising a DNA as claimed in claim 9.

Claim 30 (Withdrawn, Previously Presented): The expression vector of claim 28 further comprising a DNA encoding sorbose dehydrogenase and/or a DNA encoding sorbosone dehydrogenase.

Claim 31 (Withdrawn, Previously Presented): The expression vector of claim 29 further comprising a DNA encoding sorbose dehydrogenase and/or a DNA encoding sorbosone dehydrogenase.

Claim 32 (Withdrawn, Previously Presented): A transformant obtained by transforming a host cell with an expression vector of claim 28.

Claim 33 (Withdrawn, Previously Presented): A transformant obtained by transforming a host cell with an expression vector of claim 29.

Claim 34 (Withdrawn, Previously Presented): The transformant of claim 32, which belongs to a genus selected from the group consisting of Escherichia coli, the genus Pseudomonas, the genus Gluconobacter, the genus Acetobacter and the genus Pseudogluconobacter.

Claim 35 (Withdrawn, Previously Presented): The transformant of claim 33, which belongs to a genus selected from the group consisting of *Escherichia coli*, the genus *Pseudomonas*, the genus *Gluconobacter*, the genus *Acetobacter* and the genus *Pseudogluconobacter*.

Claim 36 (Withdrawn, Previously Presented): The transformant of claim 32, which is capable of converting D-sorbitol to 2-keto-L-gluconic acid.

Claim 37 (Withdrawn, Previously Presented): The transformant of claim 33, which is capable of converting D-sorbitol to 2-keto-L-gluconic acid.

Claim 38 (Withdrawn, Previously Presented): A method for producing a protein having a sorbitol dehydrogenase activity, which method comprises culturing a host cell transformed with an expression vector of claim 13 in a medium harvesting the sorbitol dehydrogenase having the following properties

- (a) action: catalyzes the reaction converting D-sorbitol to L-sorbose
- (b) molecular weight: about 54 kDa
- (c) coenzyme: NAD(P)<sup>+</sup> dependent
- (d) substrate specificity: specifically oxidizes sorbitol, mannitol and arbutol, but does not act on xylitol, ribitol, inositol or glycerol, or

a protein derived from the genus *Gluconobacter*, which is encoded by a gene encoding a protein having a sorbitol dehydrogenase activity, which is a DNA capable of hybridizing a DNA having a base sequence of base numbers 537 - 1991 of the base sequence depicted in Sequence Listing SEQ ID NO:1 and a partial DNA thereof, and which has sorbitol dehydrogenase activity, from the obtained culture.

Claim 39 (Withdrawn, Previously Presented): A method for producing a protein having a sorbitol dehydrogenase activity, which method comprises culturing a host cell transformed with an expression vector of claim 28 in a medium and harvesting the sorbitol dehydrogenase having the following properties

- (a) action: catalyzes the reaction converting D-sorbitol to L-sorbose
- (b) molecular weight: about 54 kDa
- (c) coenzyme: NAD(P)<sup>+</sup> dependent
- (d) substrate specificity: specifically oxidizes sorbitol, mannitol and arbutol, but does not act on xylitol, ribitol, inositol or glycerol, or

a protein derived from the genus *Gluconobacter*, which is encoded by a gene encoding a protein having a sorbitol dehydrogenase activity, which is a DNA capable of hybridizing a DNA having a base sequence of base numbers 537 - 1991 of the base sequence depicted in Sequence Listing SEQ ID NO: 2 and a partial DNA thereof, and which has sorbitol dehydrogenase activity, from the obtained culture.

Claim 40 (Withdrawn, Previously Presented): A method for producing a protein having a sorbitol dehydrogenase activity, which method comprises culturing a host cell transformed with an expression vector of claim 29 in a medium and harvesting the sorbitol dehydrogenase having the following properties

- (a) action: catalyzes the reaction converting D-sorbitol to L-sorbose
- (b) molecular weight: about 54 kDa
- (c) coenzyme: NAD(P)<sup>+</sup> dependent
- (d) substrate specificity: specifically oxidizes sorbitol, mannitol and arbutol, but does not act on xylitol, ribitol, inositol or glycerol, or



a protein derived from the genus *Gluconobacter*, which is encoded by a gene encoding a protein having a sorbitol dehydrogenase activity, which is a DNA capable of hybridizing a DNA having a base sequence of base numbers 537 - 1991 of the base sequence depicted in Sequence Listing SEQ ID NO: 1 and a partial DNA thereof, and which has sorbitol dehydrogenase activity, from the obtained culture.

Claim 41 (Withdrawn, Previously Presented): A method for producing an L-sorbose, which method comprises culturing a host cell transformed with an expression vector of claim 28 in a medium and bringing D-sorbitol into contact with the obtained culture or a treated product thereof.

Claim 42 (Withdrawn, Previously Presented): A method for producing an L-sorbose, which method comprises culturing a host cell transformed with an expression vector of claim 29 in a medium and bringing D-sorbitol into contact with the obtained culture or a treated product thereof.

Claim 43 (Withdrawn, Previously Presented): A method for producing 2-keto-L-gluconic acid, which method comprises culturing a host cell transformed with an expression vector containing a DNA encoding sorbose dehydrogenase and a DNA encoding corbosone dehydrogenase in a medium and bringing the L-sorbose obtained according to the method of claim 41 into contact with the obtained culture or a treated product thereof.

Claim 44 (Withdrawn, Previously Presented): A method for producing 2-keto-L-gluconic acid, which method comprises culturing a host cell transformed with an expression vector containing a DNA encoding sorbose dehydrogenase and a DNA encoding corbosone

dehydrogenase in a medium and bringing the L-sorbose obtained according to the method of claim 42 into contact with the obtained culture or a treated product thereof.

Claim 45 (Withdrawn, Previously Presented): A method for producing 2-keto-L-gluconic acid, which method comprises culturing the transformant of claim 36 in a medium and bringing D-sorbitol into contact with the obtained culture or a treated product thereof.

Claim 46 (Withdrawn, Previously Presented): A method for producing 2-keto-L-gluconic acid, which method comprises culturing the transformant of claim 32 in a medium and bringing D-sorbitol into contact with the obtained culture or a treated product thereof.

Claim 47 (Withdrawn, Previously Presented): A method for producing L-ascorbic acid or an alkali metal salt thereof or an alkaline earth metal salt thereof, which method comprises converting 2-keto-L-gluconic acid obtained by the method of claim 43 to L-ascorbic acid or an alkali metal salt thereof or an alkaline earth metal salt thereof.

Claim 48 (Withdrawn, Previously Presented): A method for producing L-ascorbic acid or an alkali metal salt thereof or an alkaline earth metal salt thereof, which method comprises converting 2-keto-L-gluconic acid obtained by the method of claim 44 to L-ascorbic acid or an alkali metal salt thereof or an alkaline earth metal salt thereof.

Claim 49 (New): The isolated sorbitol dehydrogenase of claim 5, which consists of SEQ ID NO: 1 or a fragment thereof that has sorbitol dehydrogenase activity.